



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.              | CONFIRMATION NO.       |
|---|-------------|----------------------|----------------------------------|------------------------|
| 10/762,526  | 01/23/2004  | Chang Won Choi       | 2557-000177/US                   | 5346                   |
| 30593 7590 05/03/2007<br>HARNES, DICKEY & PIERCE, P.L.C.<br>P.O. BOX 8910<br>RESTON, VA 20195 |             |                      | EXAMINER<br>LUND, JEFFRIE ROBERT |                        |
|   |             |                      | ART UNIT<br>1763                 | PAPER NUMBER           |
|   |             |                      | MAIL DATE<br>05/03/2007          | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                    |  |
|------------------------------|--------------------------------------|------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/762,526 | <b>Applicant(s)</b><br>CHOI ET AL. |  |
|                              | <b>Examiner</b><br>Jeffrie R. Lund   | <b>Art Unit</b><br>1763            |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 February 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) 40-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-39 and 44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/06: 3/07</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 2, 7, 12, 13, and 44 are rejected under 35 U.S.C. 102(b) as being anticipated by Koshiishi et al, US Patent 5,919,332.

Koshiishi et al teaches a bottom electrode 6 arranged below the semiconductor wafer W and acting as a stage; a solid upper electrode 21 arranged above the semiconductor wafer; and insulating plate 31 arranged adjacent to the solid plate upper electrode 6 with a gap therebetween. The gap is formed at the junction of the electrode and the insulating plate. The insulating plate includes a protrusion protruding outwardly in a direction parallel to a radial direction of the body with a sloped surface and a cliff surface. (Entire document, specifically, Figure 1)

3. Claims 1, 2, 7, 12, 13, and 44 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujimoto, US Patent 5,413,673.

Fujimoto teaches a bottom electrode 52 arranged below the semiconductor wafer 50 and acting as a stage; a solid upper electrode 51 arranged above the semiconductor

Art Unit: 1763

wafer; and insulating plate 40 (42) arranged adjacent to the solid plate upper electrode 51 with a gap  $I_2$  therebetween. The insulating plate includes a protrusion protruding outwardly in a direction parallel to a radial direction of the body with a sloped surface and a cliff surface. A second gap is formed at the junction of the electrode and the insulating plate (Entire document, specifically, Figure 4 and 5)

4. Claims 1-8, 19-21, 30, and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Quon, US Patent Applicant Publication 2003/0150562 A1.

Quon teaches a bottom electrode 20 arranged below the semiconductor wafer 14 and acting as a stage; a solid upper electrode 10 arranged above the semiconductor wafer; and insulating plate 80 arranged adjacent to the solid plate upper electrode 10 with a gap therebetween; an ring type upper electrode (edge bead electrode) 30 above the wafer; and a lower edge electrode (edge bead electrode) 40. The gap is formed at the junction of the electrode and the insulating plate. The specific electrodes used to form a plasma is an intended use of the apparatus and the apparatus of Quon is capable of forming the plasma as claimed. (Entire document, specifically, Figure 1)

5. Claims 1, 2, 7, and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Kim et al, US Patent Applicant Publication 2003/0070760 A1.

Kim et al teaches a bottom electrode 155 arranged below the semiconductor wafer 154 and acting as a stage; a solid upper electrode 151 arranged above the semiconductor wafer; and insulating plate 142 arranged adjacent to the solid plate upper electrode 151 with a gap 153 therebetween. The gap is formed at the junction of the electrode and the insulating plate. The insulating plate includes a protrusion. (Entire

Art Unit: 1763

document, specifically, Figure 2B)

6. Claim 44 is rejected under 35 U.S.C. 102(e) as being anticipated by Berman et al, US Patent 6,837,967 B1.

Berman et al teaches an insulating plate 120 includes a protrusion protruding outwardly in a direction parallel to a radial direction of the body with a sloped surface and a cliff surface. (Entire document, specifically, Figure 2B)

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Quon, US Patent Application Publication 2003/0150562 A1 in view of Johnson, US Patent 2003/0201069 A1.

Quon was discussed above and includes a lower electrode and a lower ring electrode.

Quon differs from the present invention in that Quon does not teach an isolator between the lower electrode and lower ring electrode.

Johnson teaches a lower electrode 175, a lower ring shaped electrode 210, and an isolator 174 that isolates the lower electrode from the lower ring shaped electrode. (Figure 1A and 1B)

The motivation for adding the isolator of Johnson to the apparatus of Quon is to

Art Unit: 1763

isolate the lower electrode and lower ring type electrode to enable the independent control of the power supplied to each electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the isolator of Johnson to the apparatus of Quon.

9. Claims 1-8, 10, 11, 17-22, 28-32, 38, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houghton et al, US Patent Application Publication 2004/0137745 A1, in view of Quon, US Patent Application Publication 2003/0150562 A1.

Houghton et al teaches a bottom electrode 140 arranged below the semiconductor wafer 100 and acting as a stage and including a chuck; a solid upper electrode 145 arranged above the semiconductor wafer; and a ring type electrode 175 above and below the wafer. The chuck inherently includes a plurality of straight or curved open grooves. (Entire document, specifically, Figure 4) The distance between the wafer and the upper electrode is small enough to prevent a plasma from being formed.

Houghton et al differs from the present invention in that Houghton et al does not teach individual upper and lower ring type electrodes (edge bead electrodes), an insulating plate having a gap, the specific electrodes used to form a plasma or additional interchangeable plates.

Quon was discussed above and includes upper and lower ring type electrodes (edge bead electrodes) and an insulating plate with a gap.

The motivation for replacing the ring electrode of Houghton et al with the ring

Art Unit: 1763

electrodes and insulation plate of Quon is to replace the single ring electrode with an upper and lower electrode to give more control to where the plasma is formed as taught by Quon.

The motivation for adding the insulating plate of Quon to the apparatus of Houghton et al is to isolate the upper electrode and upper ring type electrode as taught by Quon.

The motivation for using specific electrodes to form a plasma is to form the plasma in a specific location relative to the apparatus. Furthermore, it has been held that: claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus " if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the upper and lower ring type electrodes and insulating plate of Quon to the apparatus of Houghton et al, and use specific electrodes to form a plasma.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houghton

Art Unit: 1763

et al, US Patent Application Publication 2004/0137745 A1, and Quon, US Patent Application Publication 2003/0150562 A1, as applied to claims 1-8, 10, 11, 17-22, 28-32, 38, and 39 above, and further in view of Johnson, US Patent Application Publication 2003/0201069 A1.

Houghton et al and Quon differs from the present invention in that they do not teach an isolator between the lower electrode and lower ring electrode.

Johnson teaches a lower electrode 175, a lower ring shaped electrode 210, and an isolator 174 that isolates the lower electrode from the lower ring shaped electrode. (Figure 1A and 1B)

The motivation for adding the isolator of Johnson to the apparatus of Houghton et al and Quon is to isolate the lower electrode and lower ring type electrode to enable the independent control of the power supplied to each electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the isolator of Johnson to the apparatus of Houghton et al and Quon.

11. Claims 12-16, 23-27, and 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houghton et al, US Patent Application Publication 2004/0137745 A1, and Quon, US Patent Application Publication 2003/0150562 A1, as applied to claims 11-8, 10, 11, 17-22, 28-32, 38, and 39 above, and further in view of Koshiishi et al, US Patent 5,919,332.

Houghton et al and Quon differs from the present invention in that they do not teach that the insulating plate includes a protrusion with a sloping side and a cliff side



Art Unit: 1763

that prevents plasma from flowing to the center of the wafer, or variable sized plates.

Koshiishi et al was discussed above and includes insulating plate with a protrusion having a sloped surface and cliff surface. The protrusion controls the location of the plasma and prevents it passing from one section (i.e. inner or outer) to the other section (i.e. outer or inner).

The motivation for adding the protrusion of Koshiishi et al to the apparatus of Houghton et al and Quon is to control the location of the plasma as taught by Koshiishi.

The motivation for making the insulating plates of various sizes is to enable the control the location and extent of the plasma by changing the insulating plate.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the protrusion of Koshiishi to the apparatus of Houghton et al and Quon and to make the insulating plate in various sizes.

### ***Response to Arguments***

12. Applicant's arguments, see page 9 entitled 35 U.S.C. §112 FIRST AND SECOND PARAGRAPH REJECTION, filed February 5, 2007, with respect to the 112 1<sup>st</sup> and 2<sup>nd</sup> paragraph rejections have been fully considered and are persuasive. The rejections have been withdrawn.

13. Applicant's arguments, see page 15 entitled 35 U.S.C. §102(e) HOUGHTON REJECTION, filed February 5, 2007, with respect to the rejection of claims 1-4, 6, 17, and 18 under 35 U.S.C. §102(e) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Quon et al, as discussed above.

Art Unit: 1763

14. Applicant's arguments filed February 5, 2007 have been fully considered but they are not persuasive.

In regard to the arguments that Koshiishi et al, Fujimoto et al, Quon et al, and Kim et al do not teach a gap, the Examiner disagrees. The term gap is very broad and includes wide gaps like those shown in figures 1-3 and 15 of the present invention, and small gaps like those needed to assemble multiple concentric pieces of processing chambers. Koshiishi et al, Fujimoto et al, Quon et al, and Kim et al all require a gap sized large enough to allow inner and outer concentric parts, such as the electrode and insulating plate to be fitted together. If there is no gap it is not possible for the pieces to be fitted together. Therefore, Koshiishi et al, Fujimoto et al, Quon et al, and Kim et al all have a gap between the electrode and the insulating plate. Furthermore, Fujimoto et al also specifically teaches a gap 12 between an insulating plate 40 and the upper electrode 51 (See figure 4).

In regard to the argument that Koshiishi et al and Berman et al do not teach a protrusion protruding outwardly in a direction parallel to a radial direction of the body of the insulating plate, the Examiner disagrees. The insulating plates of Koshiishi et al and Berman et al have protrusions extending in a direction parallel to the radial direction of the body i.e. radially outward from an inner edge of the insulating plate. Applicant noted that these plates also have protrusions extending in a direction perpendicular to the radial direction. The open language of the claims does not limit additional protrusions in different axial directions. Thus Koshiishi et al and Berman et al teach the claimed protrusions.

***Conclusion***

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Berman et al also teaches the gap between the electrode 102 and the insulating plate 120 controls the amount of the substrate etched.

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

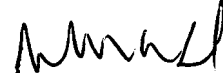
17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (10:00 am - 9:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone

Art Unit: 1763

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Jeffrie R. Lund  
Primary Examiner  
Art Unit 1763

JRL  
4/30/07